GEM Simulation

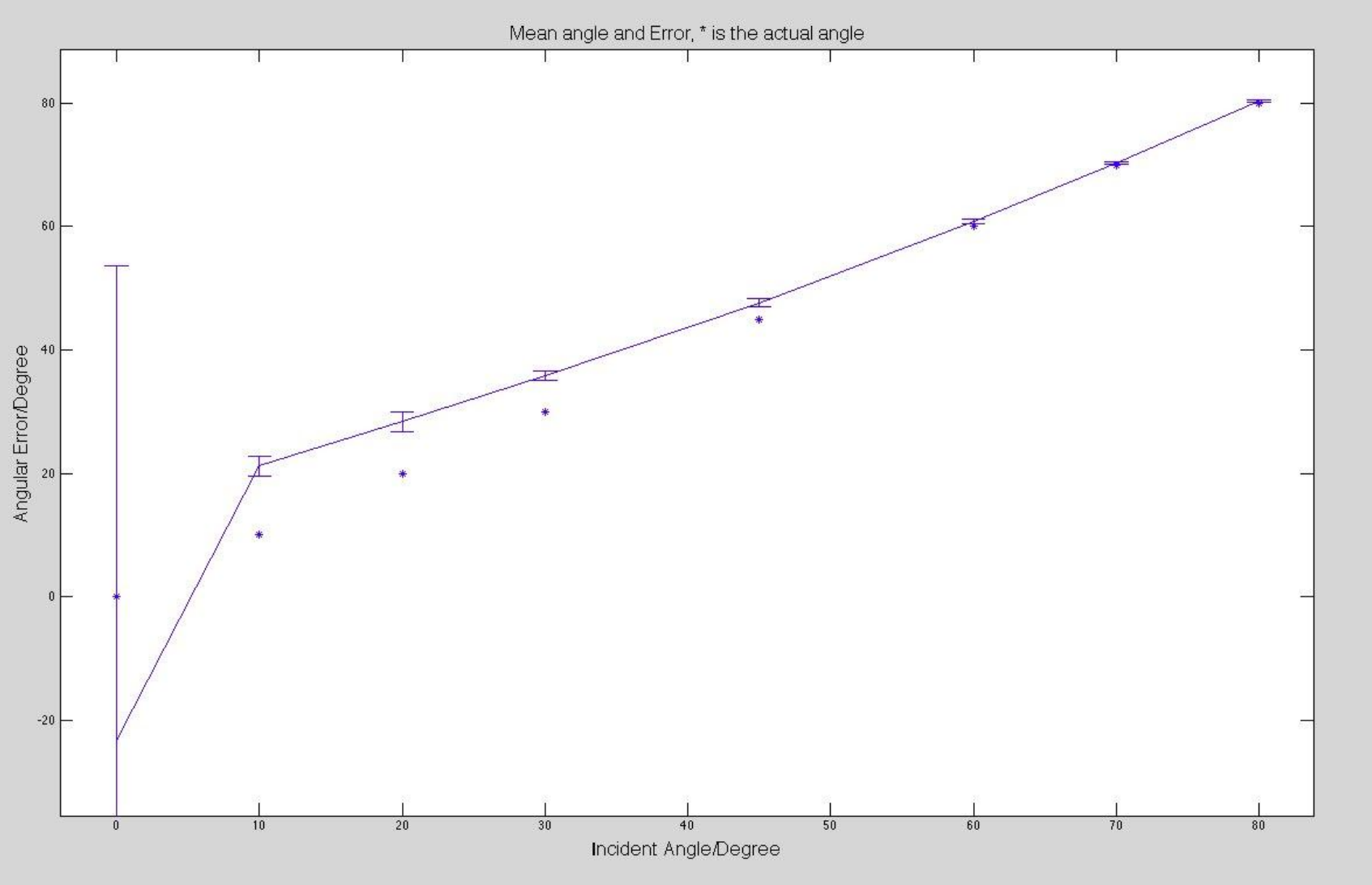
Monte Carlo

- Gas ionization
  - Ionization free path: exponential distribution
  - Cluster size: a discrete distribution (Blum's book)
- Electron drift
  - Drift each electron individually
  - Add transverse and longitudinal diffusion
- GEM amplification
  - Amplify each electron individually
  - Gain : exponential distribution
  - No model for curve field line near GEM holes

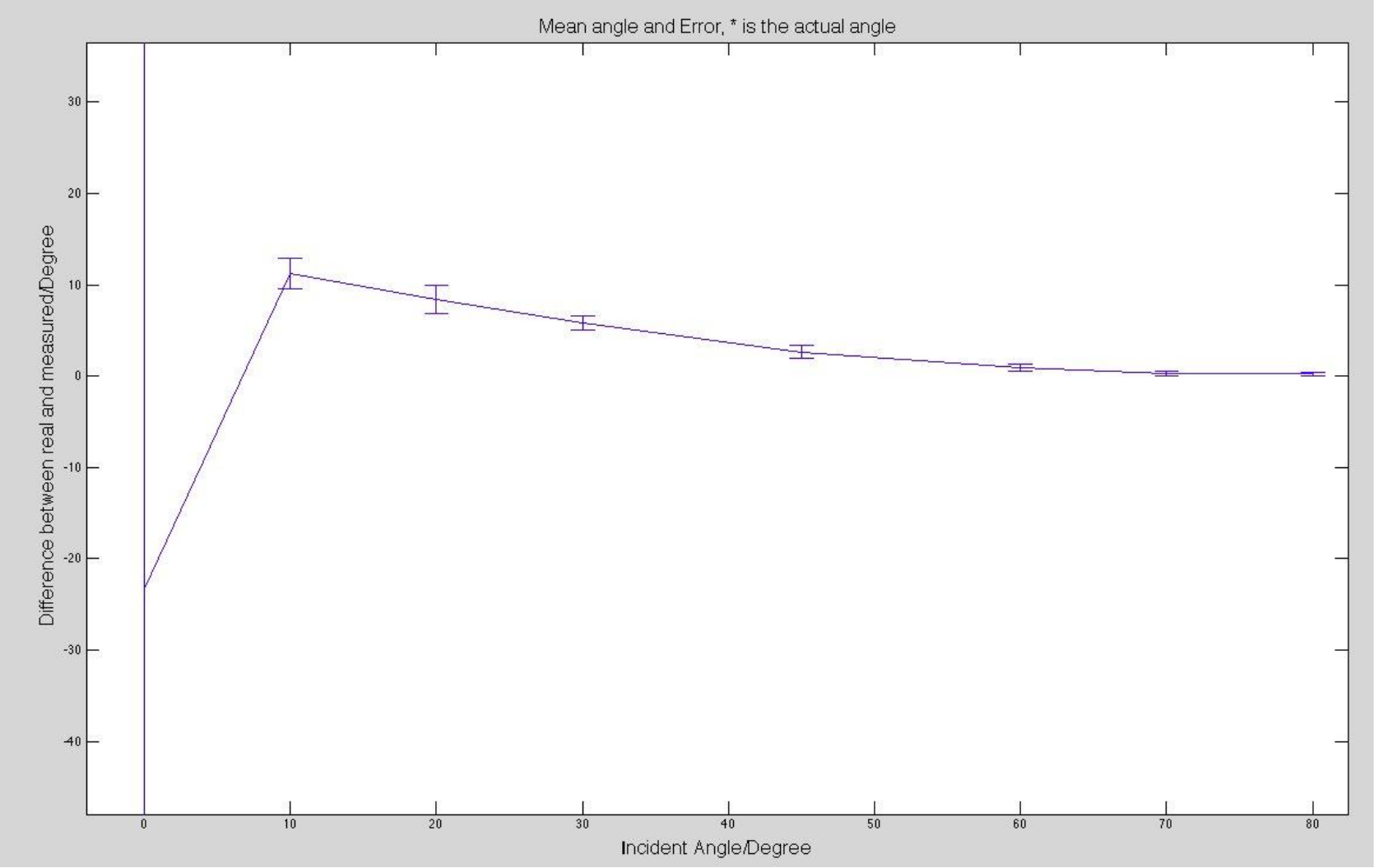
Monte Carlo

- Detection
  - Electrons are sorted based on transverse position
  - 40ns peaking time 2nd order unipolar shaper
  - Constant fraction discriminator
  - Real field line and capacitive coupling not simulated
- Reconstruction
  - Least square fit with a straight line
  - In 3D mode, fit two projections of the track

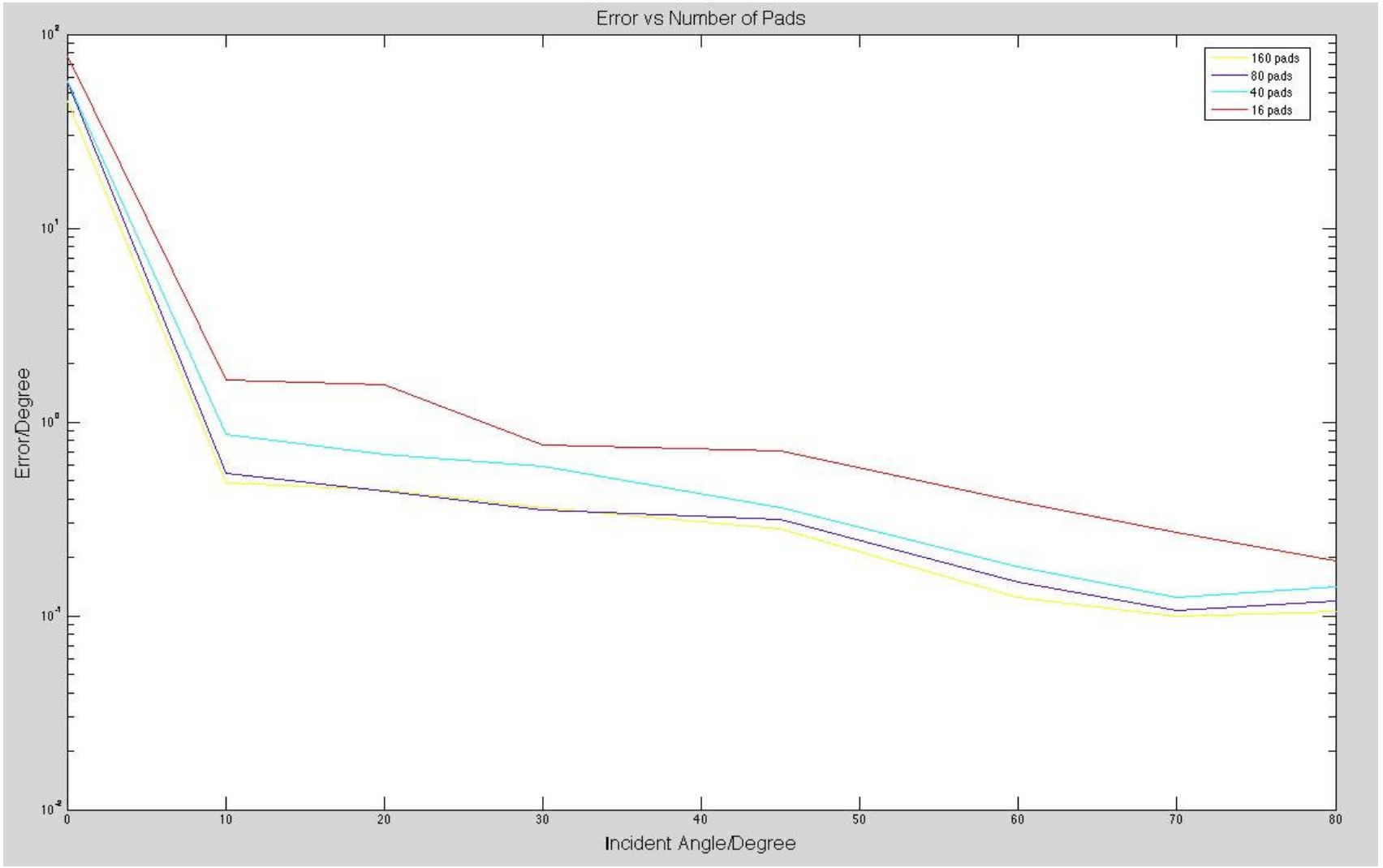
Result


Mean angle and Error, * is the actual angle
Angular Error/Degree
Incident Angle/Degree
80
60
40
20
0
-20
0
10
20
30
40
50
60
70
80

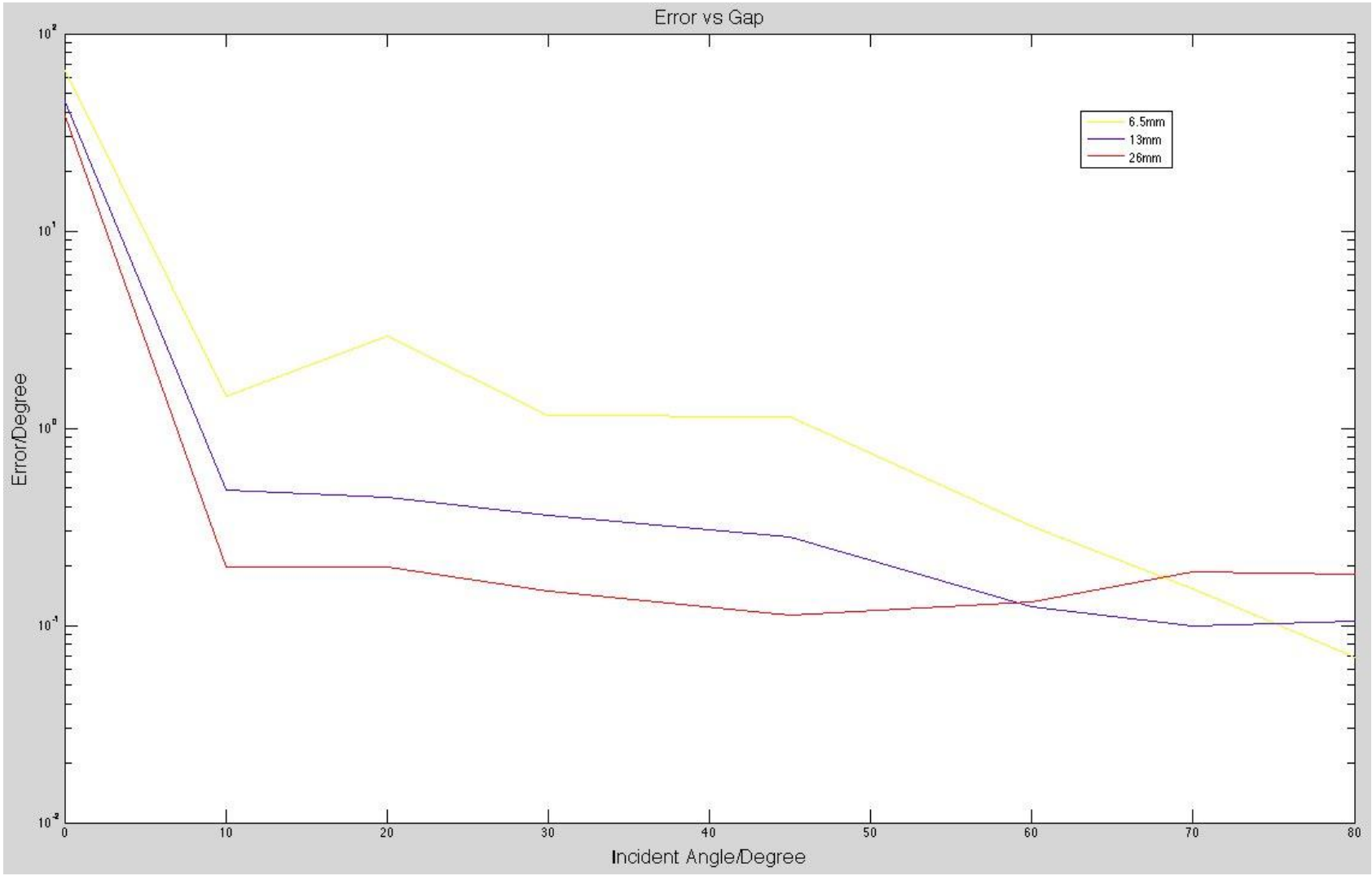
Result


Mean angle and Error, * is the actual angle
Difference between real and measured/Degree
Incident Angle/Degree
30
20
10
0
-10
-20
-30
-40
0
10
20
30
40
50
60
70
80

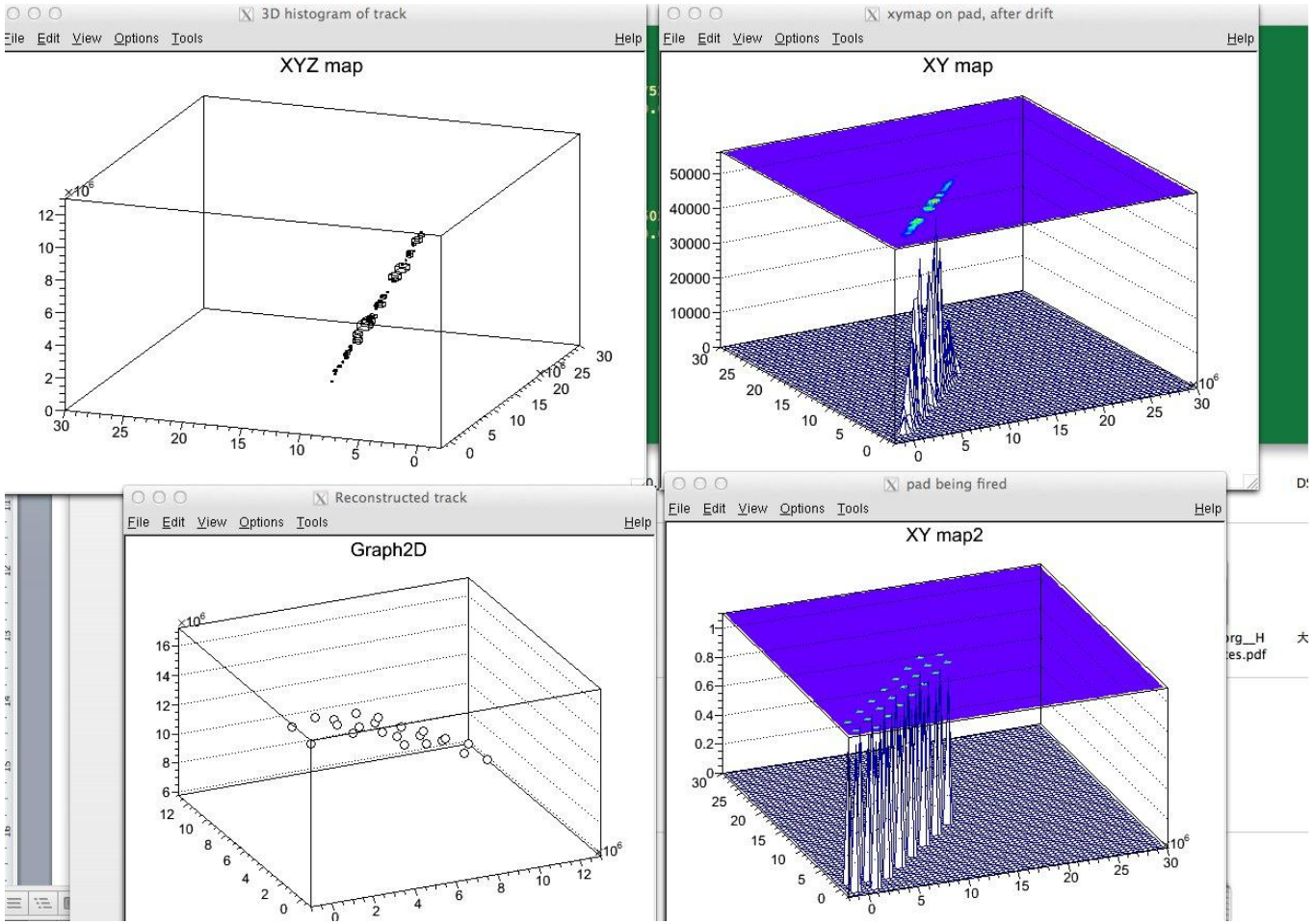
Result


Error vs Number of Pads
160 pads
80 pads
40 pads
16 pads
Error/Degree
Incident Angle/Degree
0
10
20
30
40
50
60
70
80

Result


Error vs Gap
6.5mm
13mm
26mm
Error/Degree
Incident Angle/Degree
0
10
20
30
40
50
60
70
80

Result


3D histogram of track
File Edit View Options Tools Help
XYZ map
xymap on pad, after drift
File Edit View Options Tools Help
XY map
Reconstructed track
File Edit View Options Tools Help
Graph2D
pad being fired
File Edit View Options Tools Help
XY map2